

Implement in MATLAB the following:

1. **Arithmetic Calculations:** Evaluate the following expression

$$c = \frac{a^\pi}{(\sqrt{a}-1)^2} + b$$

for $a = 2$ and $b = 3$.

2. **Trigonometric Functions:** Evaluate $\cos \theta$, where $\theta = 60^\circ$.
3. **Basic Vectors:** If $A = (1, 2, 3)$ and $B = (4, 5, 6)$
 - a) Evaluate the expression $2A - C$, where $C = (a_1/b_1, a_2/b_2, a_3/b_3)$
 - b) Raise each element in A to the power of the corresponding element in B .
4. **Functions of Vectors:** If $A = (1, 10, 100, 1000)$
 - a) For each element in A evaluate $\sin(\pi \log_{10}(a_i)/4)$ (shown for the first element a_1), putting the result in vector B .
 - b) Find the largest and the smallest element in $A.*B$. Put their values in variables `max_value` and `min_value`, respectively. Put their indexes in variables `max_index` and `min_index`, respectively.
 - c) What will be displayed when `A(length(A))` is executed?
5. **Basic Plots:**
 - a) Generate a vector A that starts at 0, has increments of 0.3, ending near 2.
 - b) Generate a vector B that starts at 0, ends at 5 and has exactly 10 elements.
 - c) Plot two cycles of a sine wave using exactly 30 data points.
6. **Multiple Plots:** Plot 3 cycles of a cosine waveform ($\cos x$) and 3 cycles of a sine waveform ($\sin x$). Start plots at $x = 0$, with increments of 0.1
 - a) Plot the two curves on a single graph using a solid line for the cosine and a dashed line for the sine.
 - b) Plot the two curves on separate panes in the same figure window.
7. **M-File Script, Conditional Structure, and Loop Structures:** Write M-files that display the indexes of the negative elements in a vector.
 - a) Use a for loop structure.
 - b) Use a while loop structure.

Execute the M-files for the vector $A = (1, 2, -1, 0, 5, 6, -3, 1, 8)$.
8. **Complex Numbers:** Given $a = 5 - j8$ and $b = 1 + j3$, find $c = \frac{b^2}{a}$
 - a) in rectangular form,
 - b) in polar form.